

**CLAIMS**

1. A method for producing tetrafluorosilane by decomposing hexafluorosilicic acid with sulfuric acid, which comprises:

5 a step of decomposing hexafluorosilicic acid in concentrated sulfuric acid in a first reactor to give tetrafluorosilane and hydrogen fluoride, and taking out the thus-formed tetrafluorosilane (step 1);

10 a step of transferring at least a part of the concentrated sulfuric acid solution of step 1 containing hydrogen fluoride into a second reactor to allow the hydrogen fluoride to react with silicon dioxide which is fed into the second reactor, thereby producing tetrafluorosilane containing hexafluorodisiloxane (step 2); and

15 a step of bringing the reaction product of step 2 containing hexafluorodisiloxane and tetrafluorosilane to the first reactor so that the hexafluorodisiloxane in the reaction product is reacted with hydrogen fluoride to convert it into tetrafluorosilane, and taking out the resulting 20 tetrafluorosilane along with the tetrafluorosilane formed in step 1 (step 3).

2. The method for producing tetrafluorosilane as claimed in claim 1, wherein an aqueous hexafluorosilicic acid solution and 25 concentrated sulfuric acid are fed into the first reactor, silicon dioxide is fed into the second reactor each continuously or intermittently, and tetrafluorosilane is continuously or intermittently taken out of the first reactor.

30 3. The method for producing tetrafluorosilane as claimed in claim 1 or 2, wherein the sulfuric acid concentrations in the first and second reactors are kept 70 mass% or more.

4. The method for producing tetrafluorosilane as claimed in any one of claims 1 to 3, wherein the reaction temperatures in the first and second reactors are 60°C or higher.

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5. The method for producing tetrafluorosilane as claimed in claim 1 or 2, wherein the particle size of silicon dioxide fed to the second reactor is 30 µm or less.

10 6. The method for producing tetrafluorosilane as claimed in claim 1 or 2, comprising a step of contacting the tetrafluorosilane taken out of the first reactor with concentrated sulfuric acid at 50°C or lower so that hydrogen fluoride contained in the tetrafluorosilane is absorbed and removed.

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7. The method for producing tetrafluorosilane as claimed in claim 6, wherein the tetrafluorosilane taken out of the first reactor is countercurrently contacted with concentrated sulfuric acid that is supplied through a channel to the first reactor.

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8. The method for producing tetrafluorosilane as claimed in claim 1 or 2, comprising a step of purifying the tetrafluorosilane taken out of the first reactor with molecular sieving carbon so as to remove the impurities from the tetrafluorosilane.

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9. The method for producing tetrafluorosilane as claimed in claim 8, wherein the removed impurities include one or more members selected from the group consisting of hydrogen fluoride, hydrogen chloride, sulfur dioxide, hydrogen sulfide and carbon dioxide.

30 10. The method for producing tetrafluorosilane as claimed in

claim 8 or 9, wherein the molecular sieving carbon to be used has a smaller pore size than the molecular size of tetrafluorosilane.

5 11. The method for producing tetrafluorosilane as claimed in claim 10, wherein the molecular sieving carbon pretreated by baking in an inert gas atmosphere and then introducing thereinto high-purity tetrafluorosilane is used.

10 12. Gas for production of optical fibers, which contains the tetrafluorosilane gas obtained according to the production method as described in any one of claims 1 to 11, comprising transition metal, phosphorus and boron each at concentration of 100 ppb or less.

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13. Gas for production of semiconductors, which contains the tetrafluorosilane gas obtained according to the production method as described in any one of claims 1 to 11, comprising transition metal, phosphorus and boron each at concentration of 100 ppb or  
20 less.

14. Gas for production of solar cells, which contains the tetrafluorosilane gas obtained according to the production method as described in any one of claims 1 to 11, comprising transition metal, phosphorus and boron each at concentration of 100 ppb or  
25 less.